

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Jiansan SUN et al. Group Art Unit: 2861
Serial No.: 10/773,388 Examiner: Lisa Solomon
Filed: February 05, 2004
Title: HEATING ELEMENT, FLUID HEATING DEVICE, INKJET
PRINTHEAD, AND PRINT CARTRIDGE HAVING THE SAME AND
METHOD OF MAKING THE SAME

AMENDMENT UNDER 37 CFR 1.111

COMMISSIONER FOR PATENTS
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Sir:

In response to the Office Action dated January 30, 2006, Applicants hereby request that the above-identified application be amended as follows:

Amendments to the specification are reflected on page 2 of this document.

Amendments to the Claims are reflected in the listing of claims that begins on page 4 of this document.

Remarks begin on page 6 of this document.

Amendments to the Specification

Paragraph [0035] on page 11 is to be replaced with the following paragraph:

-- After the FORM CONDUCTIVE TRACES step 52, the sequence 50 proceeds to a FORM RESISTOR step 64, wherein resistive material is deposited on the planarized surface to form the resistive layer 18 thereon as shown in Figure 4E. The resistive layer 18 444 is patterned and etched to expose a part of the first conductive trace 22 thereunder as shown in Figure 4F. Specifically, a photoresist material 56 is deposited over the resistive layer 18, masked using a second mask, exposed and developed to a second pattern on the second mask, using the photolithographic process as described above. The resistive layer 18 and photoresist material 56 are then etched using either dry or wet etch to leave the structure as shown in Figure 4F. The photoresist material 56 deposited over the resistive layer 18 is then removed before the deposition of a next layer on the structure. The photoresist material initially covers the entire top surface of the resistive layer 18. The pattern on the second mask is a pattern that defines the top surface of the resistive layer 18 that is to remain for straddling the first and second conductive traces 22, 24 after etching. During etching, the area of the resistive layer 18 that is not covered with the photoresist material 56 is etched away. --

Paragraph [0041] on page 13 is to be replaced with the following paragraph:

-- A heating element 80 (Figure 6E) according to a second embodiment of the invention is next described with the aid of Figures 5 and 6A-6D. Figure 5 is a flow chart showing a sequence 82 of steps for fabricating the heating element 80. The sequence 82 starts in a FORM CONDUCTIVE LAYER sub-step 84 of a FORM CONDUCTIVE LAYER step 52, wherein a conductive layer 20 is formed over a capping layer 12 on a substrate 10 as shown in Figure 6A. Next, a portion

of the conductive layer 20 is removed using a photolithographic process as described above to obtain the structure shown in Figure 6B. As can be seen in Figure 6B, the conductive layer 20 is separated into a first conductive trace 22 and a second conductive trace 24. The first and second conductive traces 22, 24 are separated by a void 86 therebetween to be electrically insulated from each other. --

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claims 1-13 (Withdrawn)

Claims 14-17 (Cancelled)

18. (Currently amended) A method of manufacturing a heating element for a printhead, said method comprising according to Claim 14, wherein forming a conductive layer comprises:

forming an insulating layer on a the substrate;
partially etching through the thickness removing portions of the insulating layer to define a protruding portion having substantially vertical sidewalls and flanked by two shoulder portions;

depositing forming a conductive layer on the insulating layer to cover the protruding portion and the shoulder portions; and

planarizing a surface of the conductive layer to expose the protruding portion to thereby form a separate the first conductive trace separate from a the second conductive trace; and

forming a resistive layer over the planarized surface of the conductive layer and the exposed protruding portion.

19. (Currently amended) A method according to Claim 18 44, wherein the resistive layer is at least substantially uniformly thick.

20. (New) A method for manufacturing a thermal inkjet printhead, said method comprising:

forming an insulating layer on a substrate;

partially etching through the thickness of the insulating layer to define a protruding portion having substantially vertical sidewalls and flanked by two shoulder portions;

depositing a conductive layer on the insulating layer to cover the protruding portion and the shoulder portions;

planarizing a surface of the conductive layer to expose the protruding portion to thereby form a first conductive trace separate from a second conductive trace; and

forming a resistive layer over the planarized surface of the conductive layer and the exposed protruding portion; and

forming an ink chamber above the resistive layer.

21. (New) The method of claim 20 further comprising:

forming a passivation layer between the resistive layer and the ink chamber, said passivation layer being made of an insulating material.

22. (New) The method of claim 21 further comprising:

forming a cavitation barrier layer between the passivation layer and the ink chamber.

REMARKS

By the above amendment, Claims 14-17 have been cancelled, Claim 18 has been amended, and new Claims 20-22 have been added. No new matter has been introduced by way this amendment. Claims 1-13 and 18-22 are pending in the present application, of which Claims 1-13 are withdrawn from consideration. Favorable reconsideration of this application is respectfully requested in view of the above amendments and the following remarks.

Objection to the Specification

The disclosure was objected to because of some informalities on pages 11 and 13. The appropriate portions of pages 11 and 13 have been amended to obviate this objection.

Claim Rejection under 35 U.S.C §112

Claim 19 was rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Office Action asserted that the term “substantially” is a relative term which renders the claim indefinite. This rejection is respectfully traversed. The term “substantial” is a meaningful modifier implying “approximate” rather than “perfect.” Liquid Dynamics Corp. v. Vaughan Co., Inc., 355 F.3d at 1368 (Fed. Cir. 2001). In Cordis Corp. v. Medtronic AVE, Inc., 339 F.3d 1352, 1361 (Fed. Cir. 2003), the court refused to impose a precise numeric constraint on the term “substantially uniform thickness,” noting that the proper interpretation of this term was “of largely or approximately uniform thickness.” Thus, it is well established that the term “substantially” is unambiguous in meaning when it is used as a modifier as in the present case. Accordingly, withdrawal of the rejection under 35 USC §112 is requested.

Claim Rejection Under 35 U.S.C. §102

Claims 14-17 and 19 were rejected under 35 U.S.C. 102(a) as being anticipated by Miller et al. (US 6,558,969).

By the above amendment, Claims 14-17 have been cancelled and Claim 19 has been amended to depend on Claim 18. Accordingly, this rejection is now moot.

Claim Rejection Under 35 U.S.C. §103

The test for determining if a claim is rendered obvious by one or more references for the purpose of a rejection under 35 U.S.C. § 103 is set forth in MPEP § 706.02(j):

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Therefore, if the above-identified criteria are not met, then the cited reference(s) fails to render obvious the claimed invention and, thus, the claimed invention is distinguishable over the cited reference(s).

Claim 18 was rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. ("Miller").

The amended Claim 18 recites a method of manufacturing a heating element, which comprises, inter alia:

"forming an insulating layer on a substrate;
partially etching through the thickness of the insulating layer to define a protruding portion having substantially vertical sidewalls and flanked by two shoulder portions."

Support for the amendment to Claim 18 is provided, for example, in FIG. 4B and page 10, lines 5-9, of the present application. Claim 18 further recites: “depositing a conductive layer on the insulating layer to cover the protruding portion and the shoulder portions” and “planarizing a surface of the conductive layer to expose the protruding portion to thereby form a first conductive trace separate from a second conductive trace.” It is submitted that Miller does not disclose or suggest the manufacturing method of Claim 18.

Firstly, Miller fails to disclose the step of partially etching through the thickness of an insulating layer to form a protruding portion with substantially vertical sidewalls as recited in Claim 18. Secondly, Miller discloses the following step sequence: depositing a conductive layer on a dielectric layer; etching the conductive layer to create conductive traces; depositing an insulating layer over the conductive traces; then planarizing the second insulating layer to expose the elevated surface of the conductive layer (see FIG. 4; col. 6, lines 51-61). By contrast, Claim 18 recites depositing a conductive layer over an etched insulating layer, and then planarizing the conductive layer to create conductive traces. As such, the claimed method does not involve etching the conductive layer to form conductive patterns as in the case of Miller's method. The technical challenges are different between forming the planarized conductive traces according to Miller's method and according the claimed method.

Because Miller fails to disclose or suggest all of the limitations recited in Claim 18, Miller cannot support a prima facie case of obviousness regarding the subject matter of Claim 18. Therefore, Claim 18 is patentable over Miller. Claim 19, which depends on Claim 18, is also patentable over Miller at least by virtue of its dependency on Claim 18.

New Claims

New Claims 20-22 contain the method limitations of Claim 18. It is believed that the subject matter of Claims 20-22 is patentable over Miller at least for the same reasons that Claim 18 is patentable.

Conclusion

In light of the foregoing, withdrawal of the rejections of record and allowance of the present application are earnestly solicited.

Date : April 26, 2006

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Thi Dang', with a stylized, cursive script.

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